

From: Dave Bradley <bradleydave2015@gmail.com>
Sent: Thursday, October 13, 2022 2:54 PM
To: DES SBCC
Cc: Dave Bradley
Subject: Comments on Proposed Updates to the Washington State Energy Code - Residential
Attachments: [SBCC Energy Code Comments.pdf](#)

External Email

Dear Members of the State Building Code Council:

I am writing to express my strong support for the proposed changes to the residential energy code. Specifically, I urge the State Building Code Council to adopt the following two proposals:

- Proposal 21-GP2-065. Heat pump space heating.
- Proposal 21-GP2-066. Heat pump water heating.

I believe there are strong scientific and public policy rationales for each of these proposals, but I also believe they each could be strengthened by reducing the scope of proposed exceptions/exemptions related to the use of heat pumps when replacing older heating equipment in existing residential buildings. I have attached more detailed comments to this email.

Thank you for the opportunity to provide comments on the proposed changes to the residential energy code. I urge you to expeditiously review all public comments and issue a final rule.

Sincerely,

Dave Bradley

401 18th Ave SE

Olympia WA 98501

Comments on Proposed Updates to the Washington State Energy Code – Residential

Prepared by Dave Bradley

I am writing to express my strong support for the proposed changes to the residential energy code. Specifically, I urge the State Building Code Council to adopt the following two proposals:

- Proposal 21-GP2-065. Heat pump space heating.
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Requirement for Heat Pump Space Heating in New Residential Buildings (Proposal 21-GP2-065)

R403.13 specifies that “[...]space heating shall be provided by a heat pump system...” Although I’m disappointed that the State Building Code Council (SBCC) decided to modify the original electric heat pump proposal to allow both electric and natural gas heat pumps, I strongly support this proposal for the following reasons:

- The proposal will reduce residential energy use. The SBCC energy analysis estimates that an average building with heat pump space heating uses 5.58 MMBtu/yr for space heating which is 3.2 times more energy efficient than an average building using natural gas (17.78 MMBtu/yr). Full implementation of the SBCC heat pump space heating proposal could reduce cumulative residential energy use in single-family homes constructed during the 2022 – 2050 period by about 60% (about 63,000,000 MMBtu) relative to the implementation of current requirements.¹
- The proposal will reduce residential energy costs. The SBCC has concluded that heat pump space heating is more cost effective than both gas heating and electric resistance heating – particularly when considering the Washington State social cost of carbon. The SBCC estimates average life cycle cost savings of \$1.14 per square foot and \$4.57 per square foot when including the social cost of carbon.
 - The SBCC analysis likely understates the cost advantages of heat pump space heating. The SBCC states that construction costs for heat pump space heating are often, but not always, higher than for conventional natural gas or electric resistance heating. In August 2022, the US Congress passed the Inflation Reduction Act which provides tax credits and rebates that will serve to reduce the upfront costs of installing residential heat pumps.
 - The SBCC analysis likely understates the social benefits associated with reducing greenhouse gas emissions. The SBCC cost analysis was prepared using the current Washington State social cost of carbon (SCC). Five years ago, the National Academies of Sciences, Engineering, and Medicine (NASEM) concluded that older SCC estimates (like the Washington State SCC) are not consistent with more recent scientific research. An international scientific team recently completed a review of current scientific data.

¹ OFM estimates that Washington’s population will increase by 24% between 2022 and 2050. The US Census Bureau estimates that there were slightly more than 2 million single family homes in Washington in 2022. Almost 500,000 new homes will need to be constructed between 2022 and 2050 to meet the housing needs for the larger population. US Census Bureau also estimated that 79% of new single-family homes completed in 2021 in the West Region had forced air furnaces (vs about 17% with heat pump space heating).

They concluded that a SCC value of \$185/ton is consistent with current scientific information (\$44–\$413 per tCO₂: 5%–95% range, 2020 US dollars).² The updated value is over three times higher than the SCC value used in the SBCC analysis. Social costs calculated using a SCC value based on current scientific information would result in costs savings of over \$10 per square foot.

- The proposal will reduce cumulative GHG emissions from space heating in new single-family homes constructed during the 2022 – 2050 time period by 90% relative to current requirements. Almost 500,000³ new homes will need to be constructed between 2022 and 2050 to meet the housing needs for an expanding state population. Full implementation of the SBCC space heating proposal will minimize future increases in statewide GHG emissions by minimizing emissions from newly constructed residential buildings.
- The proposal incorporates provisions that acknowledge the technical challenges for smaller dwellings. The SBCC proposal provides exceptions for dwellings with small heating loads and allowances for supplementary heating following the requirements of Section R403.1.2.
- The proposal provides a first step that can serve as a model for other states and local governments evaluating measures to reduce building energy use and GHG emissions. Climate change is a global problem that will not be solved by a single nation, state, or city. Minimizing the adverse climate impacts in Washington will require large global reductions in GHG emissions. Consequently, SBCC's actions can have a multiplier effect on emission reductions by providing a model for other jurisdictions grappling with how to reduce the GHG footprint of residential buildings.

Exception for Replacing Certain Existing Space Heating Systems

Proposed R503.1.2 specifies that "...[n]ew heating, cooling and duct systems that are part of the alteration shall comply with Section R403...", but the SBCC has proposed several exceptions to this general requirement. Of particular concern, SBCC has proposed that "...[r]eplacements of space heating equipment shall not be required to comply with Section R403.13 where the rated capacity of the new equipment does not exceed the rated capacity of the existing equipment..." I believe this proposed exception/exemption is too broad and recommend that the SBCC modify or remove this provision prior to issuing the final rule. The rationale for this recommendation includes:

- The proposed exception/exemption will limit the effectiveness of the SBCC rule in terms of reducing GHG emissions from existing residential buildings. Replacing older furnaces at the end of their useful life provides a cost-effective opportunity to reduce GHG emissions from existing homes by replacing fossil fuel heating systems with cleaner electric heat pumps. For example, emissions from residential fossil gas used for space heating represented about 5% of Thurston County's 2020 carbon footprint. The SBCC estimates that gas furnaces have an equipment life of 18 years. Replacing existing gas furnaces at the end of their useful operational life with electric heat pumps would result in a complete turnover of space heating equipment in single family homes by 2050. The turnover in existing gas furnaces would eliminate this portion of the County's current carbon footprint by 2050 because state utilities must provide electricity from 100% renewable/non carbon sources beginning in 2045. Unfortunately, the proposed exception/exemption will allow homeowners to continue to use fossil fuel heating systems if they do not exceed the rated capacity of the existing equipment. While current gas furnaces

² Rennert, K., Errickson, F., Prest, B.C. et al. 2022. Comprehensive evidence implies a higher social cost of CO₂. Nature (2022). <https://doi.org/10.1038/s41586-022-05224-9>. Bressler (2021) has also reviewed more recent scientific information and reached similar conclusions. See Bressler, D. 2021. The mortality cost of carbon. Nature Communications. Published online on July 29, 2021.

³ This assumes that the number of single-family homes will increase in proportion with the state population growth.

are generally more efficient than older furnaces, the continued use of gas furnaces will perpetuate reliance on fossil gas for home heating needs and complicate the State's ability to achieve the GHG emission reductions specified in state law.

- The proposed exception/exemption will limit the residential energy savings associated with replacing older gas furnaces with more efficient heat pumps. The SBCC estimates that heat pump space heating is generally 2-4 times more energy efficient than either fossil fuel or electric resistance heating. The proposed exception/exemption will allow homeowners to continue using less efficient fossil fuel heating systems if they do not exceed the rated capacity of the existing equipment.
- The proposed exception/exemption will limit the residential energy cost savings associated with replacing older gas furnaces with more efficient heat pumps. The SBCC analysis notes that the capital costs associated with retrofitting an existing building with a heat pump are higher than the capital costs of installing a heat pump in a new building. The tax credits available through the Inflation Reduction Act will reduce the upfront capital costs of replacing an existing gas furnace with a heat pump and enable homeowners to reduce their monthly energy bills.
- The proposed exception/exemption will limit the social benefits associated with replacing older gas furnaces with more efficient heat pumps. The SBCC has concluded that heat pump space heating is more cost effective than both gas heating and electric resistance heating over the life cycle analysis horizon – particularly when considering the Washington State social cost of carbon. The SBCC estimates average life cycle cost savings of \$1.14 per square foot and \$4.57 per square foot when including the social cost of carbon. Social costs calculated using a SCC value based on current scientific information would result in costs savings of over \$10 per square foot.

Heat Pump Water Heating (Proposal 21-GP2-066)

Proposed R403.5.4 specifies that "...[s]ervice hot water in one- and two-family dwellings and multiple single- family dwellings (townhouses) shall be provided by a heat pump system. The heat pump water heating system shall be sized to provide 100 percent of peak hot water demand...". Although I'm disappointed that the State Building Code Council (SBCC) decided to modify the original electric heat pump water heating proposal to include allow both electric and natural gas heat pumps, I strongly support this proposal for the following reasons:

- The proposal will reduce residential energy use. The SBCC energy analysis estimate that the average building with a heat pump water heater uses 2.88 MMBtu/yr for water heating which is almost 4 times more energy efficient than a natural gas water heater (10.97 MMBtu/yr). Full implementation of the SBCC heat pump space heating proposal could reduce cumulative residential energy use in single-family homes constructed during the 2022 – 2050 period by about 65% (about 42,000,000 MMBtu) relative to the implementation of current requirements.
- The incremental benefits of the proposal exceed the incremental costs. The SBCC estimates average life cycle cost increase of \$0.27 per square foot and cost savings of \$0.42 per square foot when including the social cost of carbon. The SBCC analysis likely overstates the life cycle costs and understates the benefits of the heat pump water heating proposal because:
 - The SBCC analysis likely overstates the lifecycle costs of this proposal because it does not consider the tax credits and rebates available through the Inflation Reduction Act. The tax credits and rebates will reduce the upfront costs of installing heat pump water heaters.

- The SBCC analysis likely understates the social benefits associated with reducing greenhouse gas emissions. As noted above, an international team recently completed a review of current scientific data related to establishing a social cost of carbon. They concluded that a SCC value of \$185/ton is consistent with current scientific information (\$44–\$413 per tCO₂: 5%–95% range, 2020 US dollars). The updated value is over three times higher than the SCC value used in the SBCC analysis.
- The proposal will reduce cumulative GHG emissions from water heating in new single family homes during the 2022 – 2050 time period by about 90% relative to current requirements. Almost 500,000 new homes will need to be constructed between 2022 and 2050 to meet the housing needs of an expanding state population. Full implementation of the SBCC water heating proposal will minimize future increases in GHG emissions from newly constructed residential buildings.
- The proposal incorporates provisions that acknowledge the technical challenges for smaller dwellings. Exceptions are provided for small water heaters, small dwelling units, supplemental water heating systems, and some renewable energy systems. This includes allowances for both gas and electric heat pump water heaters. As noted below, the SBCC has also proposed that “...[r]eplacements of water heating equipment shall not be required to comply with Section R403.5.4 where the rated capacity of the new equipment does not exceed the rated capacity of the existing equipment...”
- The proposal provides a first step that can serve as a model for other states and local governments evaluating measures to reduce building energy use and GHG emissions. As noted above, SBCC’s actions can have a multiplier effect on emission reductions by providing a model for other jurisdictions grappling with how to reduce the GHG footprint of residential buildings.

Exception for Certain Water Heating Replacements

Proposed R503.1.3 specifies that “...[n]ew service hot water systems that are part of the alteration shall comply with Section R403.5...” The SBCC has also proposed that “...[r]eplacements of water heating equipment shall not be required to comply with Section R403.5.4 where the rated capacity of the new equipment does not exceed the rated capacity of the existing equipment...” I believe this proposed exception is too broad and strongly recommend that the SBCC modify/narrow this proposed exception prior to issuing the final rule. The rationale for this recommendation includes the same arguments that I have included in the rationale for removing or modifying the exception/exemption applicable to heat pump space heating. However, I believe the technical concerns identified by the TAG warrant modifying/narrowing this exception rather than completely removing it from the final rule at this time. The SBCC should re-examine the technical concerns raised by the TAG during future code updates